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(54) A device for adjusting the vane angles of a hydro turbine or a pump.

(57) The invention concerns a device for adjusting the impeller vane angles in a hydro turbine or a pump.

According to the invention the hub (5) of the turbine (pump) is provided with vanes (6) the angles of which are adjustable for obtaining a maximum utilization of the water available. The adjustments of the angles are carried out mechanically, the transmission being actuated upon by a pressure medium source outside the turbine (pump).

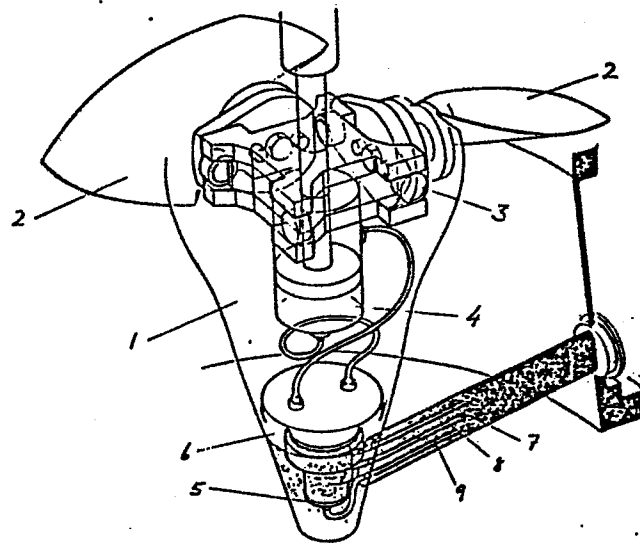


FIG. 1

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**A DEVICE FOR ADJUSTING THE VANE ANGLES OF A HYDRO TURBINE
OR A PROPELLER PUMP.**

The following description concerns the generator concept only, but the theories are of course valid also for a pump connected to an electro motor or another energy source.

The hydro turbine comprises a rotating hub provided with a number of vanes and arranged in a tube or the like for flowing water. The rotary energy obtained is transmitted to a generator for producing electric current.

The rotary energy generated is of course entirely depending on the amount of flowing water as well as its potential energy, head. The water amount may vary considerably which means that the turbine will operate with different volume flows at different times. As the turbine is designed to have a maximum efficiency at a certain flow and a certain head, the energy of the water will be utilized more or less well.

By designing the vanes adjustable, which means that the vane angle with relation to the water flow may be varied, there is a possibility to optimize the efficiency within a relatively wide range of water amounts.

By known turbine plants, where the turbine via an elongated axis is connected to a "dry" generator, the adjustment of the vanes has been quite easy to obtain by help of hydraulic or mechanical transmission means along said axis.

Lately an entirely new type of turbine/generators has been introduced. The turbine and the generator are here integrated into one unit which may be easily hoisted up from the water tube for service. This type of energy generator is especially suitable by small volumes and relatively low heads.

When such a turbine should be provided with adjustable vanes, there arise specific problems if the advantage with the easy service possibilities should not be spoiled. According to the invention this is obtained by help of the device stated in the claims.

The invention is more closely described below with reference to the enclosed drawing which shows a partly cut view of a part of the hydraulic part in a submersible energy unit which also includes a generator.

In the drawings 1 stands for a hub and 2 for vanes turnably attached to the hub. 3 stands for mechanical transmission means, 4 a hydraulic cylinder, 5, 6 a rotary unit comprising one rotating and one non-rotating part, 7, 8 and 9 finally stand for pressure medium tubes.

As mentioned above the entire machine is designed as a single unit easily mountable in a preferably vertical tube or shaft for the flowing water. This means of course great advantages when building the plants as well as during maintenance work. In order to profit as much as possible by this, it is of course important that also the means for obtaining the adjustment of the vanes are parts of the easily demountable unit. The device according to this invention makes this possible in an easy and reliable way.

Pressure medium is brought from a medium source via the tubes 7 and 8 into the rotating part 5 of the rotary unit. Said rotating part is connected to the non-rotating part 6, the transition being sealed by a mechanical seal device. This means that the rotary unit is submersible like all other parts in the device.

The rotary unit 5, 6 may be an integrated part of the hub or its cone 1 or be attached to the latter. The pressure impulses are transmitted to a hydraulic cylinder 4, which also may be an integrated part of the hub. The movement

of the hydraulic cylinder is transmitted via a mechanism 3 to the attachments of the vanes 2 in the hub.

The building of the control mechanism has several great advantages. In addition to the integrated construction previously mentioned, the equipment may be designed independant of other means, such as a gear box, which may be mounted between the turbine and the generator.

The hydraulic control of the vane adjustment is variable and very exact. The location in the bottom part of the hub cone means in addition, that a drainage may be very easily obtained through the tube 9. Another advantage is that all reaction forces are internally absorbed.

CLAIMS

1. A device for adjusting the vane angles in a hydro turbine (or a pump), characterized in, that a pressure fluid source via tubes is connected to a rotary unit integrated in or attached to the hub of the turbine (pump) arranged in the water current down stream (up stream) the vanes, from which rotary unit pressure is transmitted to a hydraulic cylinder integrated in or mounted within the hub, the movement of the cylinder mechanically actuating on the turnable attachments of the vanes in the hub.

2. A device according to claim 1, characterized in, that the turbine (pump) and the connected generator (motor) together form a submersible unit, easily removable from its surroundings, the pressure medium source and the connections between the latter and the rotary unit being parts of said submersible unit.

3. A device according to claim 1, characterized in, that the rotary unit consists of one non-rotating part to which the pressure medium tubes are connected and one part rotating with the hub, the partition between said parts being sealed by a mechanical seal.

4. A device according to claim 1, characterized in, that the control power from the hydraulic cylinder is transmitted to the vane attachments via links and slide guides.

1/1

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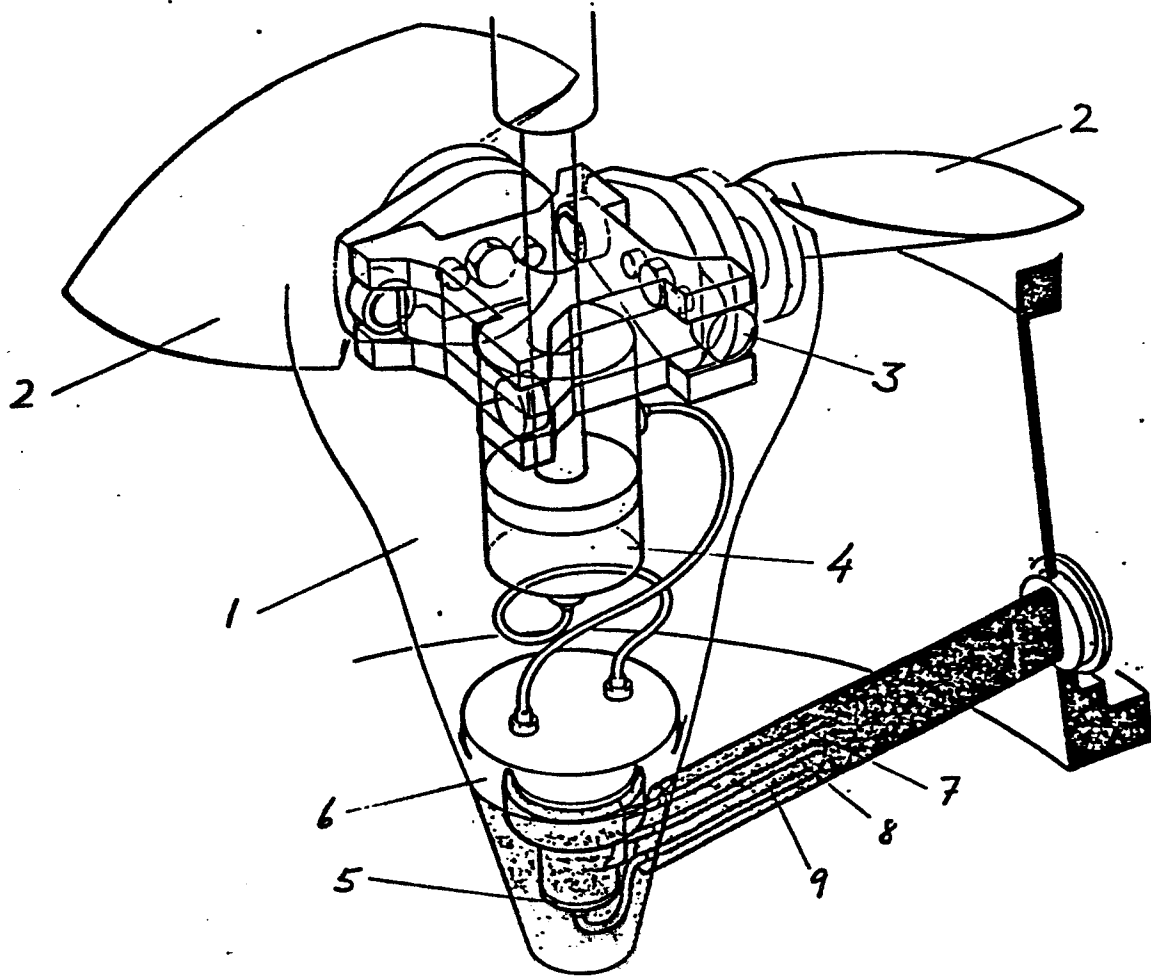


FIG. 1



European Patent
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EUROPEAN SEARCH REPORT

0174286

Application Number

EP 85 85 0264

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl. 4)
X	US-A-1 950 776 (G.A. BIGGS) * Figures 1,2 *	1,3	F 03 B 3/14
A		2,4	
A	CH-A- 170 547 (ESCHER WYSS MASCHINENFABRIKEN AG) * Figures *	1-3	
A	FR-A-1 180 324 (ESCHER WYSS SA) * Figures 1,2 *	1-3	
A	US-A-3 309 059 (M. BRAIKEVITCH) * Figures 2,4 *	4	
A	FR-E- 61 496 (ELECTRICITE DE FRANCE) * Figures *	2	TECHNICAL FIELDS SEARCHED (Int. Cl. 4)
A	US-A-3 785 747 (H.A. MAYO, Jr.)		F 03 B
A	CH-A- 435 162 (DOMINION ENGINEERING WORKS LTD.)		
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 15-11-1985	Examiner THIBO F.
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			